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March 19, 2014
Serial: HNP-14-036

10 CFR 50.73

Attn: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington DC 20555-0001

Shearon Harris Nuclear Power Plant, Unit 1
Docket No. 50-400

Subject: Licensee Event Report 2014-001-00 Manual Reactor Trip Due to Indications of a Fire

Ladies and Gentlemen:

Duke Energy Progress, Inc. submits the enclosed Licensee Event Report 2014-001-00 in accordance with 10 CFR 50.73 for Shearon Harris Nuclear Power Plant, Unit 1. This report describes a manual reactor trip of Unit 1, and an automatic actuation of auxiliary feedwater pumps, an emergency service water pump, a charging/safety injection pump, and an emergency diesel generator. The reactor was manually tripped in anticipation of inadequate feedwater flow to maintain steam generator water levels as a result of de-energizing a 480V transformer due to indications of a fire.

This document contains no regulatory commitments. Please refer any questions regarding this submittal to Dave Corlett at (919) 362-3137.


Sincerely,

A handwritten signature in black ink, appearing to read "Ernest J. Kapopoulos, Jr.", written over a horizontal line.

Ernest J. Kapopoulos, Jr.

Enclosure: LER 2014-001-00

cc: Mr. J. D. Austin, NRC Sr. Resident Inspector, Harris Nuclear Plant
Mr. A. Hon, NRC Project Manager, Harris Nuclear Plant
Mr. V. M. McCree, NRC Regional Administrator, Region II

NRC FORM 366 (02-2014)		U.S. NUCLEAR REGULATORY COMMISSION			APPROVED BY OMB: NO. 3150-0104		EXPIRES: 01/31/2017				
 LICENSEE EVENT REPORT (LER)					Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.						
1. FACILITY NAME Shearon Harris Nuclear Power Plant, Unit 1					2. DOCKET NUMBER 05000400		3. PAGE 1 OF 4				
4. TITLE Manual Reactor Trip Due to Indications of a Fire											
5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED		
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER	
01	18	2014	2014	- 001	- 00	03	19	2014	None	None	
9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)								
1			<input type="checkbox"/> 20.2201(b)		<input type="checkbox"/> 20.2203(a)(3)(i)		<input type="checkbox"/> 50.73(a)(2)(i)(C)		<input type="checkbox"/> 50.73(a)(2)(vii)		
			<input type="checkbox"/> 20.2201(d)		<input type="checkbox"/> 20.2203(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(viii)(A)		
			<input type="checkbox"/> 20.2203(a)(1)		<input type="checkbox"/> 20.2203(a)(4)		<input type="checkbox"/> 50.73(a)(2)(ii)(B)		<input type="checkbox"/> 50.73(a)(2)(viii)(B)		
			<input type="checkbox"/> 20.2203(a)(2)(i)		<input type="checkbox"/> 50.36(c)(1)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(ix)(A)		
			<input type="checkbox"/> 20.2203(a)(2)(ii)		<input type="checkbox"/> 50.36(c)(1)(ii)(A)		<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)		<input type="checkbox"/> 50.73(a)(2)(x)		
75			<input type="checkbox"/> 20.2203(a)(2)(iii)		<input type="checkbox"/> 50.36(c)(2)		<input type="checkbox"/> 50.73(a)(2)(v)(A)		<input type="checkbox"/> 73.71(a)(4)		
			<input type="checkbox"/> 20.2203(a)(2)(iv)		<input type="checkbox"/> 50.46(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(v)(B)		<input type="checkbox"/> 73.71(a)(5)		
			<input type="checkbox"/> 20.2203(a)(2)(v)		<input type="checkbox"/> 50.73(a)(2)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(C)		<input type="checkbox"/> OTHER		
			<input type="checkbox"/> 20.2203(a)(2)(vi)		<input type="checkbox"/> 50.73(a)(2)(i)(B)		<input type="checkbox"/> 50.73(a)(2)(v)(D)		Specify in Abstract below or in NRC Form 366A		
			12. LICENSEE CONTACT FOR THIS LER								
LICENSEE CONTACT Dave Corlett, Manager, Regulatory Affairs								TELEPHONE NUMBER (Include Area Code) 919.362.3137			
13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT											
CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX		
X	EC	XPT	ABB	Y							
14. SUPPLEMENTAL REPORT EXPECTED							15. EXPECTED SUBMISSION DATE		MONTH	DAY	YEAR
<input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO											
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) <p>On January 18, 2014, while operating at 75 percent power in Mode 1, Harris Nuclear Plant manually actuated the reactor protection system to trip Unit 1 due to indications of a fire in the 480V 1D2 transformer. After the reactor trip, the auxiliary feedwater system automatically initiated and provided feedwater to the steam generators. De-energizing auxiliary bus 1D caused a temporary loss of power to the 6.9kV 1A-SA safety bus, and thus the "A" auxiliary feedwater pump which was recovered when the "A" emergency diesel generator started and re-energized the 1A-SA bus. All safety systems responded as expected during this event.</p> <p>The root cause was determined to be a combination of age and various electro-magnetic conditions which over time led to failure of the 1D2 transformer. Corrective actions include transformer replacements and additional testing. The impact on safety due to this event is a small risk increase of approximately 3E-6/yr in delta core damage frequency.</p>											

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
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NARRATIVE

Energy Industry Identification System (EIIS) and component codes are identified in the text as [XX].

Background

On January 18, 2014, Harris Nuclear Plant (HNP) commenced a rapid downpower of Unit 1 from 100 percent power at approximately 9:31 a.m., in accordance with plant procedures in preparation for de-energizing the 1D2 transformer [EC, XPT] due to ground faults. Attempts were made to isolate the grounds per plant procedures. A ground was located on the 'C' pressurizer heater [AB, EHTR], but removing the pressurizer heater from service did not result in resetting the ground indications on either side of the transformer. Operations personnel observed indications of heating to the 1D2 transformer cubicle. This indicated a fault in the transformer similar to the fault that occurred on the 1E2 transformer in August 2013. Subsequently, smoke was seen by an operator and was taken as an indication of a fire in the 1D2 transformer cubicle.

Event Description

On January 18, 2014, at approximately 10:11 a.m., while operating at 75 percent power in Mode 1, HNP manually actuated the reactor protection system [JC] to trip Unit 1 in anticipation of inadequate feedwater [SJ] flow to maintain steam generator [SB, SG] water levels as a result of de-energizing the 1D2 transformer. The loss of power to the 1D2 bus [EC, BU] results in the feedwater pump [SJ, P] recirculation valves [SJ, V] fully opening thus reducing feedwater flow to the steam generators. At approximately 10:13 a.m., the auxiliary feedwater (AFW) system [BA] actuated as expected based on low steam generator levels as a result of the reactor [AB, RCT] trip. Auxiliary bus 1D was de-energized at approximately 10:14 a.m. to de-energize the 1D2 transformer, which resulted in a temporary loss of power to the 6.9kV 1A-SA safety bus [EB, BU] and the "A" motor-driven AFW pump [BA, P]. The turbine-driven AFW pump actuated on undervoltage on the 1A-SA safety bus. The "A" motor-driven AFW pump was recovered when the "A" emergency diesel generator (EDG) [EK, DG] automatically started at approximately 10:15 a.m. and re-energized the safety bus which also caused the "A" emergency service water [BI], and "C" charging/safety injection [BQ] pumps to start. HNP declared an Alert at approximately 10:16 a.m. due to safe shutdown equipment affected by fire being scoped into the emergency action level (EAL) criteria. Additionally, when power was lost to the 1A-SA safety bus, containment radiation monitors [IK, MON] RM-3561A and RM-3561C lost power and initiated a containment ventilation isolation signal (CVIS) [IK] (2 out of 4 coincidence) which caused both containment vacuum relief valves [BF, V] to be inoperable. Both containment vacuum relief valves closed automatically on a receipt of the CVIS per the design of the system and were subsequently declared operable at 11:39 a.m. when the CVIS was reset. All safety systems responded as expected during this event. Unit 1 was stable in Mode 3 at approximately 1:43 p.m., and the Alert declaration was terminated at approximately 3:51 p.m. No other systems, structures or components were inoperable at the time that contributed to the event.

The 1D2 transformer was manufactured by ABB, model Type VU-9.



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This event is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A), "Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B) of this section." The systems listed in paragraph (a)(2)(iv)(B) include the reactor protection system, auxiliary feedwater, emergency service water, charging/safety injection, and emergency diesel generators.

Causal Factors

The root cause for the 1D2 transformer failure was determined to be a combination of age and various electro-magnetic environmental conditions such as transients and breaker switching which over time led to failure of the high to low side insulation barrier and ultimately a primary to secondary short.

Corrective Actions

Completed Corrective Actions

- 1) Cross-tied 1E2 bus to 1D2 bus to provide power per OP-156.02 Section 8.10.
- 2) Conducted testing on the 1D2 transformer in order to determine potential causes. This included:
 - Megger Test (work order (WO) 13342771)
 - Excitation Current Test, Polarization Tests, Power Factor Test, Transformer Turns Ratio Test (TTR), and Core to Ground Resistance Test. (WO 13343806-02)
- 3) Conducted testing on selected transformers to verify continued reliable operation. Testing included Excitation Current Test, Polarization Tests, Power Factor Test, Transformer Turns Ratio and Core to Ground Resistance.
 - Transformer-1D1 per WO 13343831
 - Transformer-1E1 per WO 13343833
 - Transformer-1D3 per WO 13343910
 - Transformer-1B2-SB per WO 13306665
- 4) Operations Standing Instruction 14-004, Ground Fault Interim Actions to Protect Safety Busses, was issued to provide an additional measure of protection to the A-SA and B-SB safety busses in the event of a hard ground associated with 6.9kV busses 1D and 1E.
- 5) Issued standing instruction 14-011 to enhance protection on the "A" and "B" EDG, turbine-driven AFW pump, distribution panels [PL] DP-1B-SB, or DP-1A-SA when performing maintenance on any one of the listed components.
- 6) Revised procedure OP-156.06 per procedure revision request (PRR) 663744 to add more guidance as to the urgency of the need to take action to remove the transformer from service.

Planned Corrective Actions

- 1) Establish a life cycle management replacement preventative maintenance (PM) of Critical Dry Type transformers. Interim measure is to replace the following transformers:



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- Transformer-1D1 per WO 13347545
 - Transformer-1E1 per WO 13347546
 - Transformer-1D3 per WO 13358390
 - Transformer-1E3 per WO 13358392
 - Transformer-1A1 per WO 13358393
 - Transformer-1A2-SA per WO 13355105/ Engineering Change (EC) 95243
 - Transformer-1A3-SA per WO 02285514 / EC 94035
 - Transformer-1B1 per WO 13358394
 - Transformer-1B2-SB per WO 2275914 / EC 93898
 - Transformer-1-4A6 per WO 13358395
 - Transformer-1B3-SB per WO 13355101 / EC 95242
 - Transformer-1E2 per WO 2274375 (complete)
- 2) Change the classification for Transformer-1D2 from 'important to 'critical'
 - 3) Incorporate preventative and predictive maintenance techniques into the HNP PM Program for all dry-type station service transformers via preventative maintenance request 670141

Safety Consequences

The HNP reactor trip on January 18, 2014 was considered an uncomplicated reactor trip with no significant impact on public health and safety. The risk increase for a calculated reactor trip with the 1D bus unavailable (no off-site power provided to the "A" safety bus) results in a delta core damage frequency (CDF) of approximately $3E-6$ /yr. The base CDF is approximately $6E-6$ /yr.

While a fire did not occur in this event, for comparison purposes, the fire conditional core damage probability (CCDP) for the 1D2 transformer is approximately $3E-5$ and the base fire CDF is approximately $1.5E-5$ /yr. However, the 1D2 transformer is located in the "A" switchgear [SWGR] room, the fifth highest ranked fire compartment at HNP.

Based on this quantitative analysis, this event did not cause a significant increase in risk to the public.

Previous Similar Events

A search of the HNP corrective action database was conducted to determine if this event was recurring. In August 2013, HNP experienced a loss of the 1E2 480V bus due to a failed station service transformer. The root cause evaluation determined that the 1E2 transformer failed due to a turn to turn failure.

Commitments

This report contains no regulatory commitments.